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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the light filter obtained from the photopolymerization nature constituent for light filters and this constituent which are used by manufacture of the optical light filter used for a color television, a liquid crystal display element, a solid state image pickup device, a camera, etc., In detail, it is related with the photopolymerization nature constituent for light filters and the highly precise light filter of the high depth of shade which were excellent in high sensitivity at development nature.

[0002]

[Description of the Prior Art]A light filter usually forms a black matrix in the surface of transparent substrates, such as glass and a plastic sheet, Then, it is manufactured by forming color patterns, such as stripe shape of 5-200-micrometer width of three or more sorts of different hue, red, green, blue, etc., or mosaic shape, in the accuracy of several micrometers. Typical manufacturing methods of a light filter include a staining technique, print processes, a pigment dispersion method, an electrodeposition process, etc. The photopolymerization nature constituent which contains the charge of a color material especially is applied on a transparent substrate among these, The pigment dispersion method which forms a color filter image by repeating hardening by image exposure, development, and necessity has high accuracy, such as a position of a color filter picture element, and thickness, is excellent in endurance, such as lightfastness and heat resistance, and since there are few defects of a pinhole etc., it is adopted widely.

[0003]Between red and a green and blue color pattern, it is common to usually arrange the black matrix of a lattice-like light blocking effect for contrast improvement. Conventionally, the method of using the photopolymer which made the black matrix distribute the method, the paints of a light blocking effect, and color which use metal membranes, such as chromium, etc.

are known. In order that the photopolymerization nature constituent for pigment dispersion method light filters may raise the light transmittance state of the wavelength made into the purpose in red and a green or blue filter and may cut wavelength other than the purpose again, the charge of a color material contains it about 30% of the weight or more. In recent years, a light filter which was more excellent in color contrast is desired, and high concentration-ization of the color pigment is called for. Or it is the purpose of raising a light blocking effect especially in a black matrix, and the quantity of a black pigment is 30 to 60%, and is said for about 0.5-3-micrometer thickness to be required. There is a problem to which the light at the time of exposure is shaded by the high concentration of this charge of a color material, sensitivity and/or development nature fall to, and the accuracy of the light filter obtained by photo lithography falls further.

[0004]The sensitivity by high-concentration-izing of the charge of a color material and/or development nature, and the photopolymerization initiator system used for a pigment dispersion method in order to improve the fall of accuracy are examined variously. What uses together triazine compound or triazine compound, and an imidazole series compound as those examples (JP,6-201913,A), What uses together MIHIRAZU ketone and an imidazole series compound (JP,5-173320,A), Or "fine-chemicals" March 1, 1991 item Vol20, No.4, a dialkyl acetophenone series given in P.16-26, A benzyl dialkyl ketal system, a benzoin system, a benzoin alkyl ether system, a thio MOSANTON derivative, etc. are used for light filters (JP,4-190362,A, JP,5-303012,A, JP,6-35188,A, etc.). On the other hand, to a pan about high-sensitivity-izing of a photopolymerization nature constituent at an imidazole series compound 2-mercaptopbenzthiazole, Adding aromatic mercapto compounds, such as 2-mercaptop benzoxazole and 2-mercaptopbenzimidazole, is made (JP,59-56403,A).

[0005]However, although satisfaction \*\*\*\* sensitivity is considerably obtained in the photopolymerization constituent for red, green, or blue by using these compounds, The sensitivity lowering by the light blocking effect at the time of exposure is remarkable in the black photopolymerization constituent for black matrices which contains a black pigment and a color in high concentration especially, sensitivity is still insufficient, exposure time became long, and there was a fault that productivity was low. In order to improve the development nature of the photopolymerization nature constituent for light filters and to obtain an acute pattern edge part, using polyfunctional thiol compounds is also known (JP,5-281734,A). in this case, radical in - sulphydryl group -- a carbon-carbon unsaturated bond is made to carry out anti-Markownikoff addition-like or in ion, and the joint ingredient is made to construct a bridge by a polyfunctional thiol That is, since it is used as a cross linking agent, the amount used is used quite so much with 20 % of the weight. In this case, since thiol compounds are included so much, there is a problem of a bad smell, and there is a problem also in respect of definition.

[0006]

[Problem(s) to be Solved by the Invention] The photopolymerization nature constituent for light filters where this invention solved the above-mentioned conventional problem and which was excellent in development nature, definition, and pattern shape by high sensitivity, The photopolymerization nature constituent for black matrices which contains the black pigment or color of a light blocking effect in high concentration especially, It aims at providing the highly precise light filter obtained with the photopolymerization nature constituent for light filters which contains a color pigment or a color in high concentration, and the photopolymerization nature constituent for these light filters. An object of this invention is to provide the photopolymerization nature constituent for light filters for manufacturing the color filter picture element which has the outstanding endurance again.

[0007]

[Means for Solving the Problem]A photopolymerization nature constituent for light filters of claim 1 of this invention, In binder resin, a compound which has at least one ethylenic unsaturated double bond, a photopolymerization initiator system, a charge of a color material, and a photopolymerization nature constituent for light filters containing a solvent, It is characterized by a thing for which this photopolymerization initiator system is chosen from (I) polyfunctional thiol compounds and a (II) biimidazole compound, a titanocene compound, a triazine compound, and an oxadiazole compound and which contain a kind at least.

[0008]A photopolymerization nature constituent for light filters of claim 2 is characterized by polyfunctional thiol compounds being aliphatic series polyfunctional thiol compounds in the constituent according to claim 1. In the constituent according to claim 1 or 2, as for a photopolymerization nature constituent for light filters of claim 3, a photopolymerization initiator system contains (III) amino group content sensitizing dye further. A photopolymerization nature constituent for light filters of claim 4 is characterized by binder resin being an organic high polymer substance which contains an ethylenic unsaturated double bond in a side chain in the constituent according to any one of claims 1 to 3.

[0009]A photopolymerization nature constituent for light filters of claim 5 is characterized by binder resin being a copolymer which has an ethylenic unsaturated double bond, a carboxyl group, and hydroxyl in the constituent according to any one of claims 1 to 4. A photopolymerization nature constituent for light filters of claim 6 is characterized by binder resin being a styrene system copolymer which has an ethylenic unsaturated double bond, a carboxyl group, and hydroxyl, or an acrylic copolymer in the constituent according to any one of claims 1 to 5. A light filter of claim 7 is a light filter which applies the constituent according to any one of claims 1 to 6 on a transparent substrate, and is obtained ultraviolet rays or by carrying out far ultraviolet ray lithography.

[0010] This invention is explained in detail below.

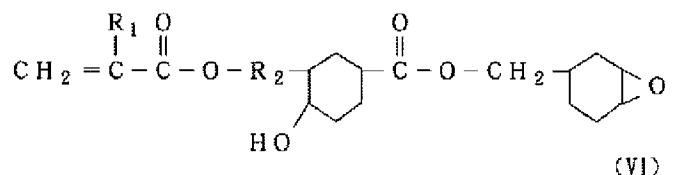
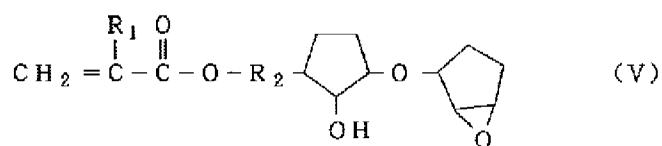
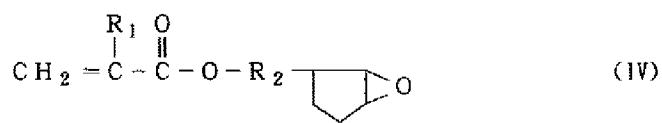
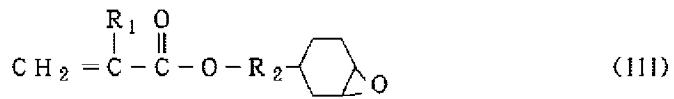
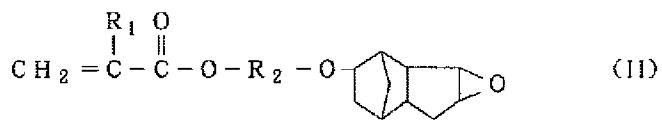
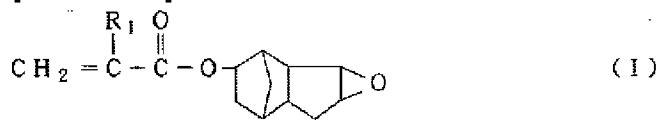
(Binder resin) A photopolymerization nature constituent for light filters of this invention contains binder resin as a material which does so a function as a binding material which raises compatibility, film-forming, development nature, and an adhesive property. In order for a black matrix which are each color picture elements and beam-of-light protection-from-light material to raise high sensitivity and a film strength of a matrix formed by being highly minute and carrying out image formation, especially as an organic high polymer substance as binder resin, an organic high polymer substance which has an ethylenic unsaturated double bond is mentioned to a side chain. Especially, a copolymer which has an ethylenic unsaturated double bond, a carboxyl group, and hydroxyl is used preferably. This copolymer is obtained by introducing the above-mentioned functional functional group into polymers, such as carrying out copolymerization of the monomer which has the above-mentioned functional group and/or a styrene system copolymer, and an acrylic copolymer, using various reactions. A styrene system copolymer or an acrylic copolymer which has an ethylenic unsaturated double bond, a carboxyl group, and hydroxyl especially is preferred.

[0011]As an example of an organic high polymer substance which carries out the piece owner of the ethylenic unsaturated double bond to a side chain concerning this invention at least, Styrene system monomers, such as styrene, alpha-methyl-styrene, and vinyltoluene; Acrylic acid, Unsaturated group containing carboxylic acid, such as methacrylic acid, cinnamic acid, maleic acid, fumaric acid, a maleic anhydride, and itaconic acid; Methyl (meta) acrylate, Ethyl (meta) acrylate, propyl (meta) acrylate, allyl (meta) acrylate, Butyl (meta) acrylate, 2-ethylhexyl (meta) acrylate, Hydroxyethyl (meta) acrylate, hydroxypropyl (meta) acrylate, Hydroxyphenyl (meta) acrylate, such as benzyl (meta) acrylate, Ester; acrylonitrile which is acrylic acid (meta), such as methoxyphenyl (meta) acrylate benzyl (meta) acrylate; Vinyl acetate, It is obtained by introducing an ethylenic double bond into copolymers, such as acid vinyl, such as BASA tic acid vinyl, vinyl propionate, vinyl cinnamic acid, and vinyl pivalate, by the usual polymeric reaction etc. at a side chain.

[0012]A method of introducing an ethylenic unsaturated double bond into a side chain in an organic high polymer substance which has an ethylenic unsaturated double bond in a side chain used for this invention can be introduced by organic combination of an ester bond, an amide bond, an ether bond, imide bonding, a urethane bond, etc. As an example of an introduction reaction, some or all of a carboxylic acid group and/of said organic high polymer copolymer, and hydroxyl, making it react to aliphatic series epoxy group content unsaturated compounds, such as glycidyl (meta-) acrylate, allyl glycidyl ether, and the alicyclic epoxy groups content unsaturated compound of the following structure, and also introducing -- although -- it can do. In this specification, "an acrylic (meta)" shows "an acrylic or methacrylic one." The same may be said of "acrylate (meta)."

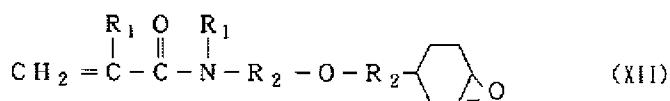
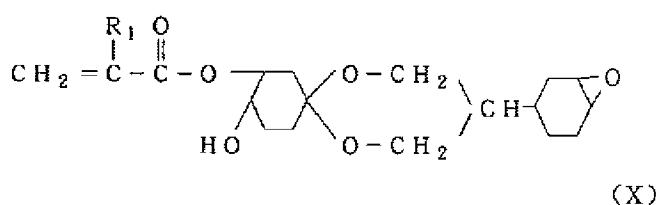
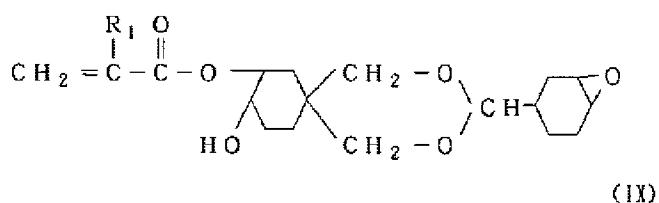
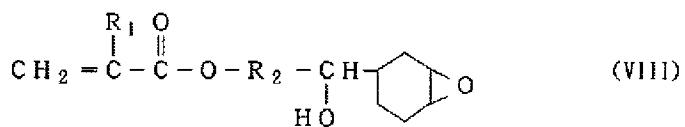
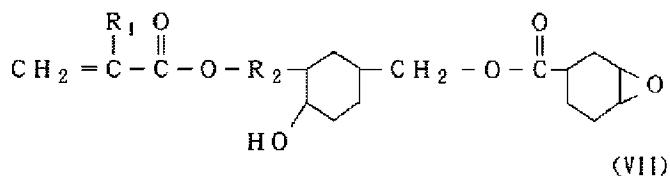
[0013]

[Formula 1]



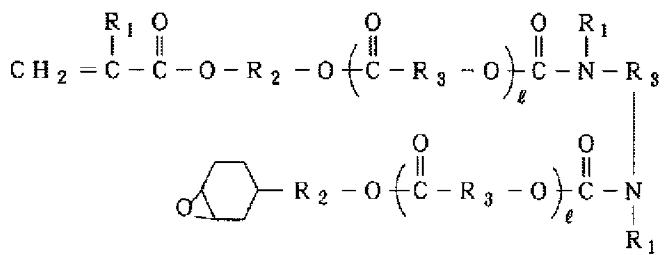
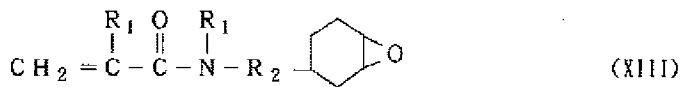
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[Formula 2]

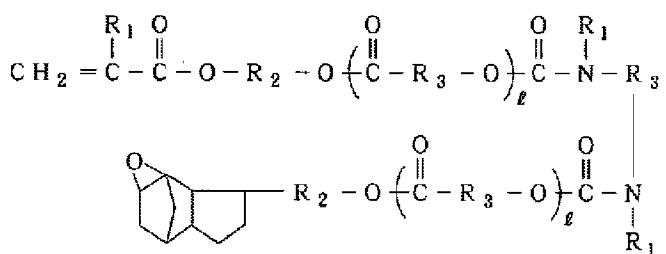


[0015]

[Formula 3]



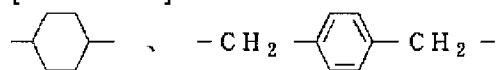
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(XV)

[0016]  $\text{R}_1$  shows a hydrogen atom or a methyl group among [each general formula.  $\text{R}_2$  shows the divalent aliphatic-saturated-hydrocarbon group of the carbon numbers 1-6.  $\text{R}_3$  shows the divalent hydrocarbon group of the carbon numbers 1-10.  $\text{I}$  shows the integer of 0-10. ] etc. can be mentioned. In the above, the alkylene group of a straight chain or the letter of branching, for example, methylene, ethylene, propylene, tetramethylene, ethylethylene, pentamethylene, a hexamethylene group, etc. can be mentioned as a divalent aliphatic-saturated-hydrocarbon group of the carbon numbers 1-6 shown by  $\text{R}_2$ . As a divalent hydrocarbon group of the carbon numbers 1-10 shown by  $\text{R}_3$ , they are methylene, ethylene, propylene, tetramethylene, ethylethylene, pentamethylene, hexamethylene, polymethylene, and phenylene, for example, [0017]

[Formula 4]



[0018] A basis etc. can be mentioned. In this invention, as a desirable organic high polymer substance, especially, In order to improve the adhesive property to a substrate Styrene, alpha-methylstyrene, benzyl (meta) acrylate, Hydroxyphenyl (meta) acrylate, methoxyphenyl (meta) acrylate, The copolymerization monomer which has phenyl groups, such as hydroxyphenyl

(meta) acrylamide and hydroxyphenyl (meta) acrylic sulfoamide, 10-90-mol %, desirable -- 20-80-mol % -- at 30-70-mol% of a rate more preferably, [ contain and ] In addition (meta) 2-50-mol % and the reactant to which 5-40-mol% of the epoxy group content unsaturated compound was added preferably are desirable to all the copolymerization monomers to the copolymer which contains acrylic acid at 5 to 50% of the weight of a rate preferably two to 50% of the weight.

[0019]as the molecular weight of such an organic high polymer substance -- weight average molecular weight (Mw) -- 1,000-1000, and 000 -- desirable -- 2,000-300, and 000 -- it is the range of 3,000-100, and 000 more preferably. If Mw of an organic high polymer substance is more remarkably [ than this range ] low, film Berry of a streak portion will arise at the time of development, and if Mw of an organic high polymer substance is remarkably high conversely, the poor omission nature of a non-streak part will be produced at the time of development.

[0020]Other organicity and inorganic polymers may be added for the purpose of furthermore raising performance as resist, and performance as a light filter. As these organicity and inorganic polymers, a polyethylene glycol, a polypropylene glycol, Polyether and copolymerization polyether of polytetraethylene glycol, epichlorohydrin, and bisphenol A, Polyamide, such as polyvinyl alkylether and soluble nylon, polyurethane, Polyester, such as polyethylene terephthalate/isophthalate, polyethylene adipate, PORITETORA ethylene AJIPETO, and polyethylene fumarate, an acetyl cellulose and a polyvinyl formal, a polyvinyl butyral, etc. are mentioned.

[0021](Compound which has at least one ethylenic unsaturation pile combination) A compound (the following "ethylenic compound" is called.) which has at least one ethylenic unsaturation pile combination is a compound by which it is generated from a photopolymerization initiator system mentioned later and in which a polymerization reaction is induced more radically. As an ethylenic compound, any of oligomer which have an ethylenic unsaturated double bond in a monomer, a side chain, or a main chain may be sufficient. A place which a monomer in this invention means is a concept which faces what is called a polymeric material, therefore also includes a dimer, a trimer, and oligomer in addition to a monomer in a narrow sense.

[0022]As an ethylenic compound, for example Ester of unsaturated carboxylic acid, and an aliphatic series (poly) hydroxy compound and unsaturated carboxylic acid, Ester of an aromatic polyhydroxy compound and unsaturated carboxylic acid, unsaturated carboxylic acid, polyvalent carboxylic acid and ester obtained with an aliphatic series polyhydroxy compound, Ethylene oxide of an aromatic polyhydroxy compound, an esterification reaction of a propylene oxide addition and unsaturated carboxylic acid, Ethylene oxide of an aliphatic series polyhydroxy compound, an esterification reaction of a propylene oxide addition and unsaturated carboxylic acid, Ester of caprolactone denaturation polyhydric alcohol and unsaturated carboxylic acid, a reactant of polyhydric alcohol, polyisocyanate, and unsaturated

carboxylic acid, a styryl end compound, a phosphorus-containing acid unsaturated compound, an addition of polyepoxy and unsaturated carboxylic acid, etc. are mentioned.

[0023]As ester of an aliphatic series polyhydroxy compound and unsaturated carboxylic acid, among these specifically, Ethylene glycol diacrylate, triethylene glycol diacrylate, Neopentyl glycol diacrylate, hexanediol diacrylate, Trimethylolpropane triacrylate, trimethylol triacrylate, pentaerythritol diacrylate -- and, [ pentaerythritol doria ] Pentaerythritol tetraacrylate, dipentaerythritol tetraacrylate, Dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate, Acrylic ester, such as glycerol acrylate, methacrylic acid ester which replaced acrylate of these illustration compound with methacrylate, Ester maleate etc. which were replaced with itaconic acid ester similarly replaced with itaconate, crotonic acid ester replaced with crotonate, or maleate are mentioned.

[0024]as the ester of an aromatic polyhydroxy compound and unsaturated carboxylic acid -- hydroquinone diacrylate, hydroquinone dimethacrylate, resorcinol diacrylate, resorcinol dimethacrylate, and pyrogallol -- doria -- KURIETO etc. are mentioned. Although it is not a single thing, as ester obtained by an esterification reaction with unsaturated carboxylic acid, polyvalent carboxylic acid, and a multivalent hydroxy compound, not necessarily as a typical example, A condensate of a condensate of acrylic acid, phthalic acid and a condensate of ethylene glycol, acrylic acid, maleic acid and a condensate of a diethylene glycol, methacrylic acid, terephthalic acid, and pentaerythritol, acrylic acid, adipic acid, butanediol, and glycerin, etc. are mentioned.

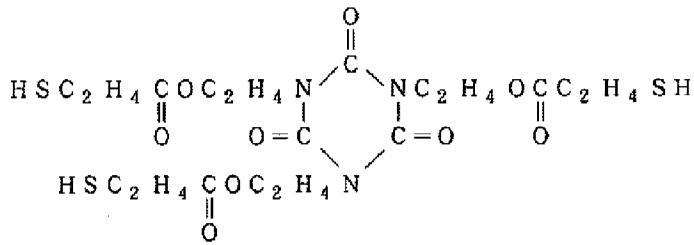
[0025]In addition, as an example of an ethylenic compound used for this invention, vinyl group content compounds, such as allyl ester; divinyl phthalate, such as acrylamide; diallyl phthalates, such as ethylene screw acrylamide, etc. are useful. As oligomer which has an ethylenic unsaturated bond in the main chain, there are polyester obtained by a polycondensation reaction of unsaturation bivalence carboxylic acid and a dihydroxy compound, polyamide obtained by a polycondensation reaction of unsaturation bivalence carboxylic acid and diamine, etc., for example.

[0026]As oligomer which has an ethylenic unsaturated bond in a side chain, there is a condensation polymer with bivalence carboxylic acid which has an unsaturated bond in a side chain, for example, itaconic acid, propylidenesuccinic acid, ethylenemalonic acid, etc. dihydroxy, or a diamine compound. A polymer which has a functional group which has the labile like a hydroxy group or a halogenation methyl group in a side chain, For example, polymer obtained by a polymeric reaction of polyvinyl alcohol, poly (2-hydroxyethyl methacrylate), polyepichlorohydrin, etc. and unsaturated carboxylic acid, such as acrylic acid, methacrylic acid, and crotonic acid, can also be used conveniently.

[0027](Photopolymerization initiator system) A photopolymerization initiator system of this invention, On improvement in sensitivity, and a development disposition, as being chosen out

of (I) polyfunctional thiol compounds and a (II) biimidazole compound, a titanocene compound, a triazine compound, and an oxadiazole compound especially for improvement in a picture characteristic, a kind is contained as it is few. Polyfunctional thiol compounds used for this invention are compounds which have two or more thiol groups in one molecule, and its aliphatic series polyfunctional thiol compounds which carry out two or more owners of the thiol group to especially an aliphatic group are preferred. If possible in the range which does not spoil performance of the target light filter, thiol compounds with low steam pressure with a large molecular weight are preferred. As an example of aliphatic series polyfunctional thiol compounds used for this invention, A HEKISANJI thiol, decanedithiol, 1,4-dimethylmercaptopbenzene, Butanediol screw thiopropionate, butanediol screw thioglycolate, Ethylene glycol screw thioglycolate, trimethylolpropanetris thioglycolate, Butanediol screw thiopropionate, trimethylolpropanetris thiopropionate, A compound of trimethylolpropanetris thioglycolate, pentaerythritol tetrakis thiopropionate, pentaerythritol tetrakis thioglycolate, tris hydroxyethyl tris thiopropionate, and the following structural formula [0028]

[Formula 5]



[0029]And they are thioglycolate of these other multivalent hydroxy compounds, thiopropionate, etc. As an example of a biimidazole compound, 2,2'-bis(o-chlorophenyl)-4,4' and 5,5'-tetraphenyl biimidazole, 2,2'-bis(o-chlorophenyl)-4,4' and 5,5'-tetra (p-carboethoxyphenyl) biimidazole, 2,2'-bis(o-chlorophenyl)-4,4' and 5,5'-tetra (p-bromophenyl) biimidazole, 2,2'-bis(o-chlorophenyl)-4,4' and 5,5'-tetra (o, p-dichlorophenyl) biimidazole, 2,2'-bis(o-bromophenyl)-4,4' and 5,5'-tetraphenyl biimidazole, 2,2'-bis(o,p-dichlorophenyl)-4,4' and 5,5'-tetraphenyl biimidazole, 2,2'-bis(o-chlorophenyl)-4,4' and 5,5'-tetra (m-methoxyphenyl) biimidazole, 2,2'-bis(o,o'-dichlorophenyl)-4,4' and 5,5'-tetraphenyl biimidazole, 2,2'-bis(o-nitrophenyl)-4,4', and 5,5'-tetraphenyl biimidazole, 2,2'-bis(o-methylphenyl)-4,4' and 5,5'-tetraphenyl biimidazole etc. can be mentioned.

[0030]As a titanocene compound, JP,59-152396,A, JP,61-151197,A, JP,63-10602,A, JP,63-41484,A, JP,2-291,A, JP,3-12403,A, JP,3-20293,A, JP,3-27393,A, JP,3-52050,A, JP,4-221958,A, JP,4-219756,A, A titanocene compound indicated to JP,3-27393,A etc. is usable, and specifically, Di-cyclopentadienyl Ti-di-chloride, di-cyclopentadienyl Ti-bis-phenyl, Di-cyclopentadienyl Ti-bis-2,3,4,5,6-pentafluoro Feni 1-yl, Dicyclopentadienyl Ti-bis-2,3,5,6-tetrafluoro Feni 1-yl, Di-cyclopentadienyl Ti-bis-2,4,6-trifluoro Feni 1-yl, di-cyclopentadienyl Ti-

bis-2,6-di-fluoro Feni 1-yl, di-cyclopentadienyl Ti-bis-2,4-di-fluoro Feni 1-yl, Di-methylcyclopentadienyl Ti-bis-2,3,4,5,6-pentafluoro Feni 1-yl, Di-methylcyclopentadienyl Ti-bis-2,3,5,6-tetrafluoro Feni 1-yl, Di-methylcyclopentadienyl Ti-bis-2,6-difluoro Feni 1-yl, di-cyclopentadienyl Ti-bis-2,6-difluoro- 3 -(\*\*\*\*- 1-yl)- Feni 1-yl etc. can be mentioned.

[0031]As an example of a triazine compound, a triazine compound which has a halomethyl group is used suitably. As those examples, 6-phenyl-2,4-bis(trichloromethyl)-s-triazine, 6-(p-methoxyphenyl)-2,4-bis(trichloromethyl)-s-triazine, 6-[p-(N,N-bis(ethoxy carbonylmethyl)amino) phenyl-2,4-bis(trichloromethyl)-s-triazine, They are 6-(p-styryl phenyl)-2,4-bis(trichloromethyl)-s-triazine and 6-p-chlorophenyl 2,4-bis(trichloromethyl)-s-triazine, 6-(p-methylthio phenyl)-2,4-bis(trichloromethyl)-s-triazine, etc.

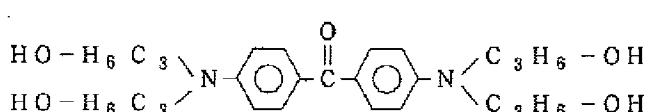
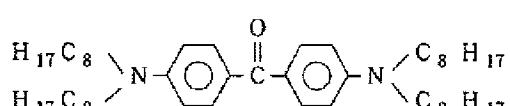
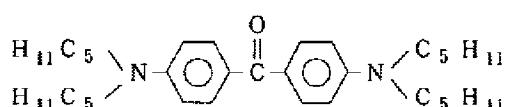
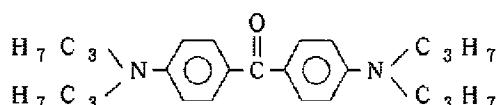
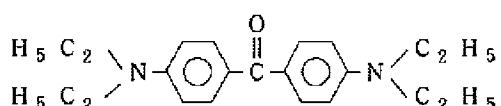
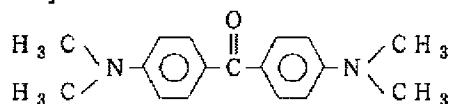
[0032]As an example of an oxadiazole compound, an oxadiazole compound which has a halomethyl group is used suitably. As those examples, the 2-phenyl-5-trichloromethyl 1 and 3, 4-oxadiazole, The 2-(p-methylphenyl)-5-trichloromethyl 1 and 3, 4-oxadiazole, The 2-(p-methoxyphenyl)-5-trichloromethyl 1 and 3, 4-oxadiazole, They are 2-styryl 5-trichloromethyl 1,3,4-oxadiazole, 2-(p-methoxy styryl)-5-trichloromethyl 1,3,4-oxadiazole, the 2-(p-butoxy styryl)-5-trichloromethyl 1 and 3, 4-oxadiazole, etc.

[0033]In this invention, by [ which use a kind at least ] being chosen out of (I) polyfunctional thiol compounds and a (II) biimidazole compound, a titanocene compound, a triazine compound, and an oxadiazole compound as a photopolymerization initiator system, Without spoiling picture characteristics, such as definition, surface degradation at the time of development, etc., sensitivity can be raised substantially and productivity can be improved. In a photopolymerization nature constituent for KARAFI routers which contained a charge of a color material so much especially, Remarkable improvement in sensitivity can be demonstrated without spoiling image formation nature, such as resolution, although details of a mechanism have an unknown charge of a color material in a black pigment and a constituent of photopolymerization nature for light filters in which the permeability of light was especially substantially restricted in carbon black. Usually, in photoresist resist, a polymerization reaction follows only a portion with which light was irradiated, and an unglared portion forms a picture using a polymerization reaction not progressing. However, light blocking effect paints (in the case of this invention, especially) carbon black etc. -- it is -- in a system included so much, Also in a portion by which the optical exposure was carried out, it is proportional to thickness from the field by which the optical exposure was carried out, a light transmission amount decreases (principle of Lambert-Beer), a light transmission amount to a rear face becomes 1% - 0.01% of the surface, and it seems that a polymerization reaction is hardly induced in a rear face. However, it seems that the adhesion of resist and a substrate was raised and high sensitivity and image formation nature have been attained while a photopolymerization reaction advanced to a resist film rear face which is an interface with a substrate and formed a

hardening layer, when a photopolymerization initiator system of this invention was used. That definition and development nature are excellent with such improvement in sensitivity, 2-mercaptopbenzthiazole given in JP,59-56403,A currently used as a high sensitivity-ized initiator system, It is an effect which cannot be guessed from aromatic monofunctional mercapto compounds, such as 2-mercaptop benzoxazole, 2-mercaptopbenzimidazole, 2-mercaptop naphthothiazole, 2-mercaptopnaphthooxazol, and 2-mercaptopnaphthoimidazole.

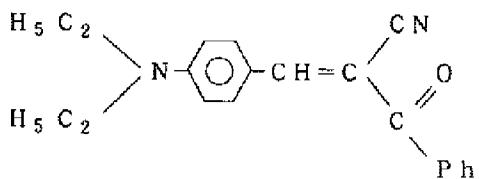
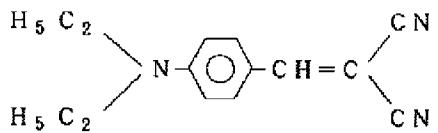
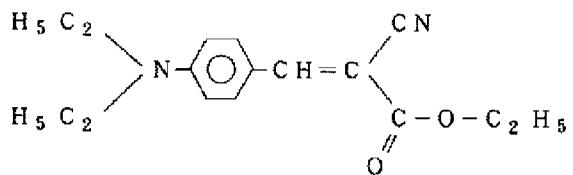
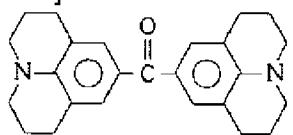
[0034]As for a photopolymerization initiator system of this invention, it is still more advantageous from a point of the above-mentioned performance that amino group content sensitizing dye is included further. A compound which a dialkyl aminophenyl group of a statement is mentioned to JP,6-19240,A, JP,6-19249,A, etc. as amino group content sensitizing dye, and is specifically expressed with the following structural formula as a compound which has a dialkyl aminophenyl group, [0035]

[Formula 6]



[0036]

[Formula 7]



[0037] Dialkyl aminophenyl carbaldehyde, such as compounds, such as p-diethylamino ethyl benzoate and MIHIRAZU ketone, p-diethylamino benzcarbaldehyde, 7-JURORIJIRU carbaldehyde, etc. are mentioned. The compound which has a dialkyl aminophenyl group is high sensitivity more, and preferred. [ among these ]

[0038](Charge of a color material) Although charges of a color material are usually red and each green and blue charge of a color material, a black matrix and a charge of a color material black when forming with this photopolymerization nature constituent are included. Here, as a charge of a color material, a metal powder, a white pigment, a fluorescent pigment, etc. can be further used by dyes and pigments of the three above-mentioned colors thru/or four colors, or a use. As a black pigment, there are carbon black, acetylene black, lamp black, boneblack, black lead, iron black, aniline black, cyanine black, etc. In these, especially carbon black is preferred from a viewpoint of a protection-from-light rate and a picture characteristic. The following carbon black is mentioned as an example of carbon black.

[0039]Mitsubishi Chemical make :: MA7, MA8, MA11, MA100, MA220, MA230, #52, #50, #47, #45, #2700, #2650, #2200, #1000, #990, #900 grade Degussa AG make :P rintex95, the

pudding textile 90, Printex85, Printex75, Printex55, Printex45, Printex40, Printex30, Printex3, PrintexA, PrintexG, SpecialBlack550, SpecialBlack350, SpecialBlack250, SpecialBlack100 grade [0040]Cabot Corp. make : Monarch460, Monarch430, Monarch280, Monarch120, Monarch800, Monarch4630, REGAL99, REGAL99R, REGAL415, REGAL415R, REGAL250, REGAL250R, REGAL330 and BLACK. PEARLS480 and PEARLS130 grade Colon Vien . Carbon company make : RAVEN11, RAVEN15, RAVEN30, RAVEN35, RAVEN40, RAVEN410, RAVEN420, RAVEN450, RAVEN500, RAVEN780, RAVEN850, RAVEN890H, RAVEN1000, RAVEN1020, RAVEN1040 grade [0041]The above-mentioned carbon black may be used together with other black inorganic matter and an organic color. As for other black pigments, since the light blocking effect is lower than carbon black, the mixing ratio is restricted naturally. As an example of other black pigments, an organic color of titanium black, aniline black, an iron oxide system black pigment and red, and three green and blue colors can be mixed, and it can use as a black pigment.

[0042]As an example of a color pigment and a color, Victoria pure blue (42595), Auramine O (41000), a KACHIRON brilliant flavin (basics 13), Rhodamine 6G CP (45160), rhodamine B (45170), The safranin O K70:100 (50240), the ERIQ glaucine X (42080), No.120/RIO Nord yellow (21090), the RIO Nord yellow GRO (21090), Simla first yellow 8GF (21105), benzidine yellow 4T-564D (21095), The Simla farce tread 4015 (12355), RIO Knoll Red seven B4401 (15850), First gene blue TGR-L (74160), RIO Nord blue SM (26150), RIO Nord blue ES (pigment blue 15:6), the RIONO gene red GD (pigment red 168), RIO Nord green 2YS (pigment green 36), etc. are mentioned (a number in still more nearly above-mentioned () means a Color Index (C. I.)).

[0043]If a C.I. number shows other paints. For example, C. I. yellow paints 20, 24, 86, 93, 109, 110, 117, 125, 137, 138, 147, and 148,153,154,166, the C.I. orangey paints 36, 43, 51, 55, 59, and 61, the C.I. red pigments 9, 97, 122, 123, 149, and 168, 177,180,192, 215,216,217, 220,223,224, 226,227,228,240, the C.I. violet paints 19,23,29, 30,37,40, and 50, the C.I. blue pigment 15, 15:1, 15:.. 4, 22, 60, 64, the C.I. green pigment 7, the C.I. Brown paints 23 and 25, and 26 grades can be mentioned.

[0044]Content of each component of a photopolymerization nature constituent for light filters of this invention, (a) As for loadings of binder resin, it is preferred to consider it as 5 to 40 % of the weight to the solid content whole quantity except a solvent, and loadings of (b) ethylenic compound, It is preferred to consider it as 5 to 40 % of the weight to the solid content whole quantity, and, as for especially loadings of a (c) photopolymerization initiator system, it is preferred to especially consider it as 1 to 10 % of the weight 0.5 to 15% of the weight 0.1 to 20% of the weight to the solid content whole quantity. A content rate of each compound in a photopolymerization initiator system, As for polyfunctional thiol compounds, 0.01 to 5% of the weight of a range, especially 0.1 to 4 % of the weight are preferred, When at least one sort of

compounds chosen from a biimidazole compound, a titanocene compound, a triazine compound, and an oxadiazole compound contain 0.01 to 5 % of the weight, and also amino group content sensitizing dye in total, it is preferred to make this into 0.01 to 5% of the weight of a range.

[0045]As for a rate of polyfunctional thiol compounds over total solids in a photopolymerization nature constituent, about 0.01 to 7 % of the weight is preferred. When polyfunctional thiol compounds are contained superfluously, formation of a small-gage wire becomes impossible, and when too small, there is a possibility that sufficient sensitivity may not be obtained. a rate of polyfunctional thiol compounds -- desirable -- 0.1-6 -- it is 0.5 to 5 % of the weight still more preferably.

[0046]As for especially loadings of a charge of a color material, it is preferred to consider it as 30 to 70% of the weight of a range 20 to 80% of the weight to total solids in a photopolymerization nature constituent. When using carbon black especially as a black pigment, As for especially loadings of said carbon black, in order for 3.0 and a high protection-from-light rate of further 3.5 or more to carry out [ rate / in 1 micrometer of thickness / protection-from-light ] black-matrix formation, it is preferred to consider it as 40 to 80% of the weight of a range 30 to 90% of the weight to total solids in a photopolymerization nature constituent. also using various dispersing agents and a distributed auxiliary agent in the range which does not spoil the purpose of this invention when blending color paints and carbon black into a constituent -- although -- it can do.

[0047]It is what dissolves and distributes each above-mentioned ingredient as a solvent in this invention, Specifically Methyl cellosolve, ethylcellosolve, butyl cellosolve, Diethylene glycol monomethyl ether, propylene-glycol-monomethyl-ether acetate (it outlines the following "PGMac".), Methyl ethyl ketone, methyl isobutyl ketone, cyclohexanone, toluene, chloroform, dichloromethane, ethyl acetate, methyl lactate, ethyl lactate, methanol, ethanol, propanol, butanol, a tetrahydro franc, etc. are mentioned.

[0048]Using these solvents, a photopolymerization nature constituent of this invention is prepared so that solids concentration may serve as 10 to 40% of the weight of a range preferably five to 50% of the weight. Since it is very high sensitivity when forming a pixel of a light filter using a photopolymerization nature constituent of this invention, it is possible to expose and develop negatives and to form a picture, without providing oxygen filter layers, such as polyvinyl alcohol.

[0049]Next, a manufacturing method of a photopolymerization nature constituent for light filters of this invention is explained. In this invention, paints dispersion liquid (color pigments, such as red, blue, and green, carbon black, etc.) are manufactured first. paints are distributed in an organic solvent -- also using various dispersing agents and a distributed auxiliary agent in the range which makes binder resin live together, and makes it distribute, and does not spoil the

purpose, in order to advance distribution easily at this time, and/or in order to stabilize dispersion liquid -- although -- it can do. As a method of distributing, a paint conditioner, a Sand grinder, a ball mill, a roll mill, a stone mill, a jet mill, a homogenizer, etc. can be used. When making a paint conditioner and a Sand grinder distribute, it is made to distribute using a glass bead or zirconia beads of a diameter of 0.1 to several millimeters. Temperature is 0 \*\* to 100 \*\*, and conditions to distribute are usually 60 \*\* from a room temperature preferably. Although dispersion time changes with paints (a color pigment, carbon) to be used, a dispersing agent made to live together, a distributed auxiliary agent, and binder resin, it is 20 hours from 20 minutes preferably from 10 minutes for 50 hours.

[0050]Then, paints (a color pigment, carbon black, etc.) and a solvent, or it consists of paints, a dispersing agent, a distributed auxiliary agent, and binder resin (red and blue.) (a) binder resin, (b) ethylenic compound, (c) photopolymerization initiator system, and the (d) solvent are added to green and black pigment dispersion liquid, various additive agents (a leveling agent, light stabilizer, etc.) are further added according to the purpose, and a resist composition is manufactured.

[0051]Next, a manufacturing method of a light filter using a photopolymerization nature constituent for light filters of this invention is explained. First, after applying a photopolymerization nature constituent for light-shielding films of this invention on a transparent substrate with coaters, such as a spinner, a wire bar, a flow coater, a die coater, a roll coater, and a spray, and drying, Place a photo mask on this sample and a black-matrix picture for protection from light is made to form by heat curing or photo-curing image exposure, development, and if needed via this photo mask, Furthermore, this operation is respectively repeated about red, blue, and green 3 colors, and thickness makes a color filter image which is 0.5-3 micrometers form on a transparent substrate. 0.1-2 micrometers, 0.3-1.5 micrometers, as for thickness of a black matrix after desiccation, it is preferred to consider it as the range of 0.5-1 micrometer, and it is preferably preferred that a beam-of-light protection-from-light rate in 1 micrometer of thickness is 3.0 or more still more preferably.

[0052]Although a transparent substrate used here is a transparent substrate for light filters and the construction material in particular is not limited, For example, polyester and polypropylene, such as polyethylene terephthalate, Polycarbonate, such as polyolefines, such as polyethylene, polymethylmethacrylate, Thermosetting plastic sheets, such as a thermoplastic plastic sheet of polysulfone, an epoxy resin, polyester resin, and a poly (meta) acrylic resin, or various glass plates can be mentioned. In particular, a glass plate and a heat-resistant plastic are preferably used from a heat-resistant point.

[0053]To such a transparent substrate, in order to improve physical properties, such as a surface adhesive property, it is preferred to perform thin film processing of various polymer, such as corona discharge treatment, ozonization, a silane coupling agent, and urethane

polymer, etc. As for especially board thickness of a transparent substrate, it is preferred that it is the range of 0.1-5 mm 0.05-10 mm. As for especially the thickness, when performing thin film processing of various polymer, it is preferred that it is the range of 0.05-2 micrometers 0.01-10 micrometers. Although a size in particular of a transparent substrate is not limited, when it is usual, as a transparent substrate, a transparent substrate of a number - a tens of cm<sup>x</sup> number - about 10 cm of numbers is used. A light source used for exposure, for example A xenon lamp, a halogen lamp, Laser light sources, such as a lamp light source of a tungsten lamp, a high-pressure mercury-vapor lamp, an ultrahigh pressure mercury lamp, a metal halide lamp, a medium-voltage mercury-vapor lamp, a low pressure mercury lamp, etc., an Ar ion laser, an YAG laser, an excimer laser, and nitrogen laser, etc. are mentioned. In this case, what is necessary is just to use a light filter suitably, in using only wavelength of specific irradiation light.

[0054]As for a development, it is preferred to use an alkali developing solution. For example, sodium carbonate, potassium carbonate, a specific silicate, a potassium silicate, Inorganic alkali chemicals, such as sodium hydroxide and a potassium hydrate, or diethanolamine, Solution which contained organic alkali chemicals, such as triethanolamine and a tetraalkylammonium hydroxide salt, and made a low molecular weight compound etc. which have a surface-active agent, a water-soluble organic solvent, a hydroxyl group, or a carboxylic acid group for the purpose, such as improvement in image quality and shortening of developing time, contain if needed is used.

[0055]As a surface-active agent of a developing solution, a sodium naphthalenesulfonate group, An anionic surface-active agent which has a sodium-benzenesulfonate group, a nonionic surface-active agent which has a polyalkylene oxy group, Can mention a cationic surface-active agent etc. which have a tetra alkylammonium group, and as a water-soluble organic solvent, Ethanol, propione alcohol, butanol, methyl cellosolve, Butyl cellosolve, phenyl cellosolve, ethylene glycol, a diethylene glycol, Triethylene glycol, tetraethylene glycol, propylene glycol, Dipropylene glycol, tripropylene glycol, tetrapropylene glycol, ethylene glycol monomethyl ether acetate, propylene-glycol-monomethyl-ether acetate, etc. can be mentioned.

[0056]As a low molecular weight compound which has a hydroxyl group or a carboxy group, 1-naphthol, 2-naphthol, pyrogallol, benzoic acid, succinic acid, glutaric acid, etc. can be mentioned. 15-40 \*\*, a development is 20-30 \*\* in developing temperature, and is usually preferably performed by methods, such as immersion development, spray development, brush development, and ultrasonic development. After a development, curing treatment can be performed in order to stabilize various physical properties. As curing treatment, there are processing by heating, processing by ultraviolet rays, etc.

[0057]

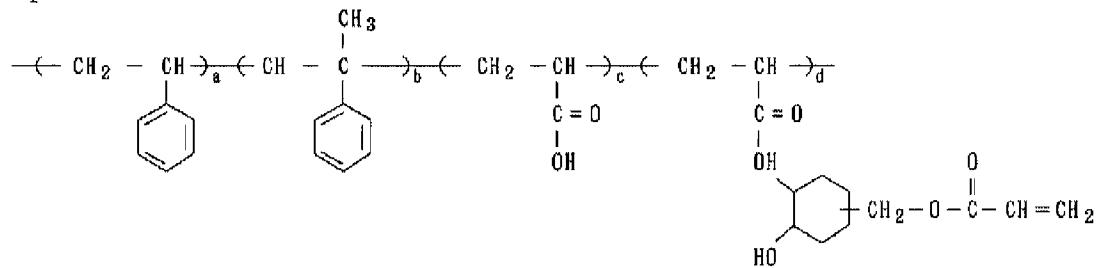
[Example] Although an example and a comparative example are given below and this invention is explained still in detail, this invention is not limited to the following examples, unless the gist is exceeded. The substance and cable address which were used for explaining this invention are shown below.

[0058]

[Table 1]

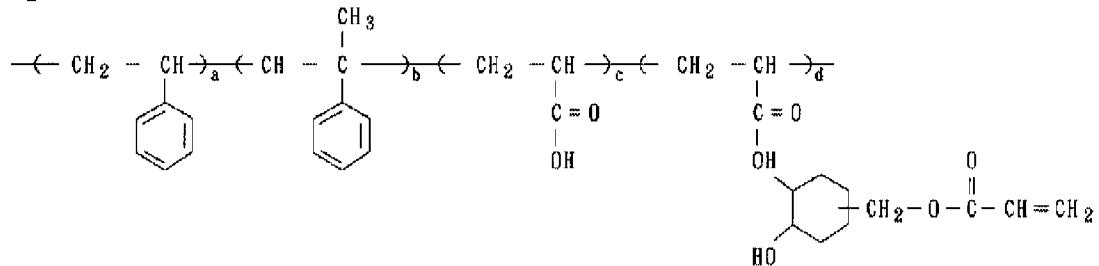
表-1 バインダ樹脂

P - 1



( a : b : c : d = 32:32:20:16 (mol%) Mw = 12000 )

P - 2



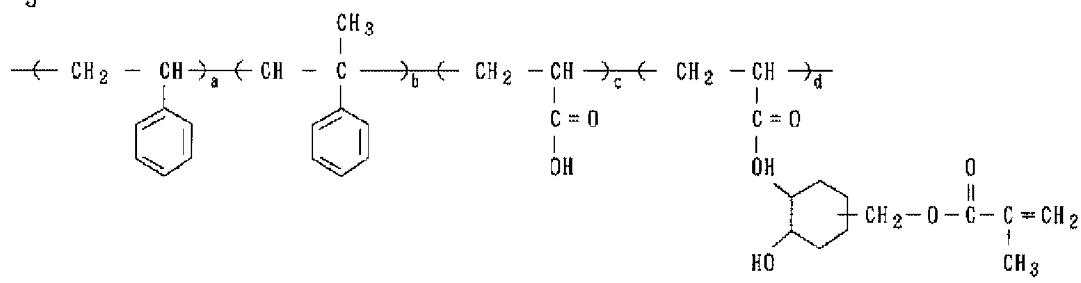
( a : b : c : d = 32:32:25:11 (mol%) Mw = 20000 )

[0059]

[Table 2]

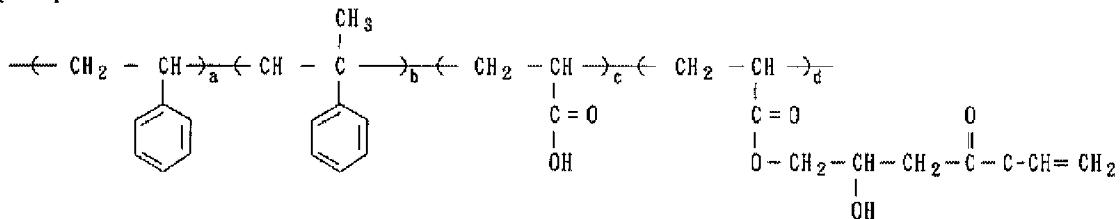
表-1 バインダ樹脂 (つづき)

P = 3



( a : b : c : d = 32:32:20:16 (mol%) Mw = 12000 )

P - 4



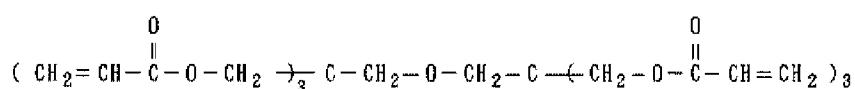
( a : b : c : d = 32:32:20:16 (mol%) Mw = 12000 )

[0060]

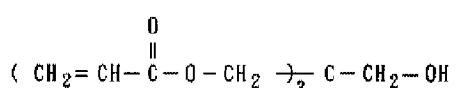
[Table 3]

表-2 エチレン性化合物

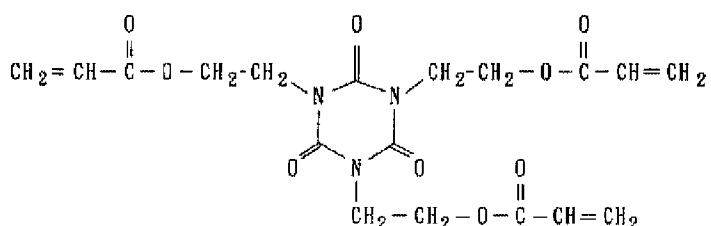
M - 1



M - 2



M - 3

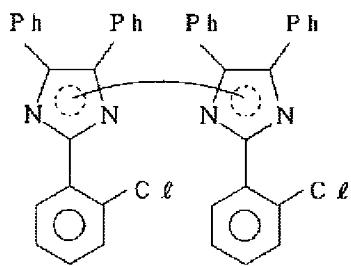


[0061]

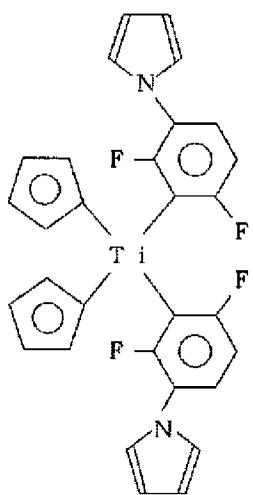
[Table 4]

表-3 光重合開始剤系

R-1 :



R-2 :

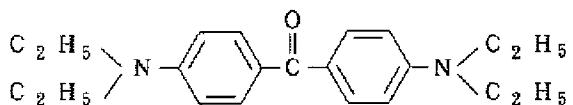


[0062]

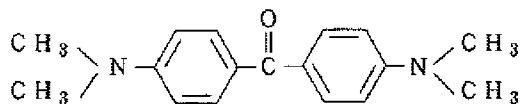
[Table 5]

## 表-3 光重合剤系(つづき)

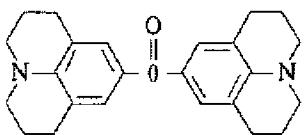
Y-1



Y-2



Y-3



T-1

ベンタエリスリトールテトラキスチオプロピオネート (P E T P)

(H S C H <sub>2</sub> C H <sub>2</sub> C O O C H <sub>2</sub> ) <sub>4</sub> C

T-2

トリメチロールプロパントリスチオプロピオネート (T M T P)

(H S C H <sub>2</sub> C H <sub>2</sub> C O O C H <sub>2</sub> ) <sub>3</sub> C C <sub>2</sub> H <sub>5</sub>

T-3

ブタンジオールビスチオプロピオネート (B D T P)

H S C H <sub>2</sub> C H <sub>2</sub> C O O C <sub>4</sub> H <sub>8</sub> O C O C H <sub>2</sub> C H <sub>2</sub> S H

[0063]

[Table 6]

Table-4 Charge black pigment of a color material Carbon black particle diameter Nitrogen adsorption specific surface area DBP-oil-absorption pH. ----- G-1 MA

220 -- Mitsubishi Chemical make 55 31 91 3.0 ----- [0064] Red pigment

G-2 RIONO gene red GD (made by Toyo Ink)

Green pigment G-3 RIO Nord green 2YS (made by Toyo Ink)

Blue pigment G-4 RIO Nord blue ES (made by Toyo Ink)

[0065] Reference examples 1-3 "Manufacture of red, green, and blue pigment distribution ink"

Red pigment Toyo Ink make RIONO gene red GD(G-2)2.6g and BYK-161 by dispersing agent big KEMI which are shown in table-4 2.6 g and 9.5 g of propylene-glycol-monomethyl-ether

acetate are mixed, This mixture was put into the paint shaker into which the 3.5-times the amount diameter zirconia beads of 0.5 mm went by weight, distribution was performed for 10 hours, and red pigment distribution ink was manufactured (reference example 1). Green pigment Toyo Ink make RIONO gene green 2YS (G-3) and blue pigment Toyo Ink make RIONO gene blue ES (G-4) were distributed similarly, and green pigment distribution ink (reference example 2) and blue pigment distribution ink (reference example 3) were manufactured.

[0066]Reference examples 4-7 "Manufacture of carbon black distribution black ink"  
Binder resin P-1 shown in carbon black Mitsubishi Chemical make MA-220 (G-1) 2.6g shown in table-4, and table-1 1.4 g and 6.0 g of propylene-glycol-monomethyl-ether acetate are mixed, This mixture was put into the paint shaker into which the 3.5-times the amount diameter zirconia beads of 0.5 mm went by weight, distribution was performed for 10 hours, and carbon black distribution black ink was manufactured (reference example 4). Binder resin was similarly changed into P-2 (reference example 5), P-3 (reference example 6), and P-4 (reference example 7), and carbon black distribution black ink was manufactured.

[0067]To the carbon black dispersion liquid obtained by the example 1 reference example 4, as an ethylenic double bond content compound, dipentaerythritol hexaacrylate (M-1), As a photopolymerization initiator system, 2,2'-bis(o-chlorophenyl)-4,4' and 5,5'-tetraphenyl biimidazole (R-1), 4 and 4'-bis(diethylamino)benzophenone (Y-1) and pentaerythritol tetrakis thiopropionate (T-1) are blended at a rate shown in following table-5, Coating liquid was prepared so that propylene-glycol-monomethyl-ether acetate might be added and it might become 25% about solids concentration.

[0068]The coating liquid containing the prepared carbon black was applied by the spin coater so that dry membrane thickness might be set to 0.9 micrometer to a glass substrate, and it was dried for 3 minutes with the drying temperature of 70 \*\*. Next, NEGAFOTOMASUKU for black matrices repeated in 300 micrometers long and a 100-micrometer-wide pitch at 30 micrometers in width is used, After exposing with a fitness light exposure (50 mj/cm<sup>2</sup>) with 3Kw ultrahigh pressure mercury lamp, Using the developing solution which consists of 0.01% of the weight of a potassium hydrate, and solution containing 0.05% of nonionic surface-active agent (Kao emulgen A-60), shower development is carried out and 23 \*\* of development was stopped with pure water, and it rinsed by the rinsing spray continuously, and the black matrix was made to form. Then, heat treatment was performed for 10 minutes and this sample was made to heat-harden at 200 \*\*. The obtained black matrix had sharp edge shape, the line width stability at the time of development (development latitude) is also 15 seconds or more, and surface rough \*\* by a developing solution was not observed, either. When spreading, exposure, and development were similarly performed using the photo mask with the line/space from 1 micron to 50 microns, image quality has also reproduced a small-gage wire of 10

micrometers or less.

[0069] Except having changed the thiol compounds of comparative example 1 Example 1 into 2-mercaptobenzothiazole (2MBT) from pentaerythritol tetrakis thiopropionate, When carried out like Example 1, the amount of appropriate exposure was 3000  $\text{mJ/cm}^2$  needed, and image quality was not able to reproduce 15 micrometers, either. The surface roughness at the time of development was intense, and many white spots were observed on the surface.

[0070] The carbon black black distribution ink of Examples 2-4 and two to comparative example 4 Example 1 was changed into the red pigment distribution ink, green pigment distribution ink, and blue pigment distribution ink which were manufactured by the reference examples 1-3, and coating liquid was adjusted like Example 1 except having carried out as the weight ratio of the core ingredient was shown in table-5. It applied by the spin coater and the glass substrate was made to dry the coating liquid containing the adjusted color pigment so that dry membrane thickness may be set to 1.3 micrometers. Next, it exposes using the negative mask for colored pixels repeated in the pitch of 30 micrometers at the side of 100 micrometers, and 300 micrometers in height, Negatives were developed using the developing solution which consists of solution containing 0.2 % of the weight of potassium hydrates, and 0.5 % of the weight of nonionic surface active agents, development was stopped with pure water, it rinsed by the rinsing spray, and the colored pixel was made to form. Then, heat treatment was performed for 10 minutes and this sample was made to heat-harden at 200 \*\*. The obtained colored pixel was carrying out proper taper shape while having sharp edge shape. Reduction of the thickness by the time of development was not accepted. The reproducibility of the small-gage wire was also 10 micrometers or less, and was good image quality.

[0071] On the other hand, in Examples 2-4, when pentaerythritol tetrakis thiopropionate was changed into 2-mercaptobenzthiazole (2MBT) (comparative examples 2-4), thickness was decreasing about 3 to 10%. The rate and evaluation result of each ingredient of an example and a comparative example are shown in following table-5. [ of a constituent ] Weight % in front shows the rate over total solids. Pigment concentration, a transmittance factor density fitness light exposure, and image quality show the meaning of the following, or the method of evaluation.

[0072] [Pigment concentration] Rate of each paints contained in the solid content of each charge content photopolymerization nature coating liquid of a color material.

Pigment concentration = the transmittance factor density (ABS) of the sample was measured using weight / total-solids weight [transmittance factor density] Macbeth densimeter TR-927 of paints. The thickness of the photosensitive layer of a sample was measured by alpha-step by a ten call instrument company, and it indicated in ( ).

[0073] The [amount of appropriate exposure] After applying and drying the charge content photopolymerization nature coating liquid of a color material on a glass substrate, A light

exposure after exposing with 3Kw ultrahigh pressure mercury lamp, placing the Ugra test chart on a sample and changing various light exposures from up [ of this chart ], in case the thinnest positive of the thin line image in the Ugra test chart image obtained by performing a development and the line width of a negative become the same.

[Image quality] After applying and drying the charge content photopolymerization nature coating liquid of a color material on a glass substrate, it exposed in the amount of appropriate exposure using the Ugra test chart, the development was performed using the standard developing solution, and the colored image was made to form by the same method as the above. The thin line image in this colored image was observed under 400 times as many microscopes, and the following standard estimated image quality from the line width of the thinnest small-gage wire currently reproduced. Such good image quality is shown that the thin small-gage wire is reproduced.

The small-gage wire with a line width of A:10 micrometers or less is reproduced.

The small-gage wire with a line width of B:10-15 micrometers is reproduced.

The small-gage wire with a line width of C:15-25 micrometers is reproduced.

The small-gage wire with a line width of not less than D:25 micrometers is reproduced.

[0074]

[Table 7]

表 - 5

	バインダ 樹脂	エチレン性 化合物	光重合開始剤系			顔料 (濃度)	透過濃度 (膜厚 $\mu\text{m}$ )	適正 露光量	画質
実施例 1	P-1 29重量%	M-1 14重量%	R-1 1.9 重量%	Y-1 1.4 重量%	T-1 1.7 重量%	G-1 52重量%	3.3 (0.9)	50 mj/cm <sup>2</sup>	A
比較例 1	P-1 29重量%	M-1 14重量%	R-1 1.9 重量%	Y-1 1.4 重量%	2MBT 1.7 重量%	G-1 52重量%	3.2 (0.9)	3000	C
実施例 2	P-1 36重量%	M-1 18重量%	R-1 2.3 重量%	Y-1 1.7 重量%	T-1 2.0 重量%	G-2 40重量%	—	5	A
実施例 3	P-1 36重量%	M-1 18重量%	R-1 2.3 重量%	Y-1 1.7 重量%	T-1 2.0 重量%	G-3 40重量%	—	5	A
実施例 4	P-1 36重量%	M-1 18重量%	R-1 2.3 重量%	Y-1 1.7 重量%	T-1 2.0 重量%	G-4 40重量%	—	5	A

[0075]The thiol compounds of five to example 6 Example 1 From pentaerythritol tetrakis thiopropionate to trimethylolpropanetris thiopropionate (T-2). When carried out like Example 1 except having changed into butanediol thiopropionate (T-3), the amounts of appropriate exposure were 70 mj/cm<sup>2</sup> and 80 mj/cm<sup>2</sup>, respectively. Image quality could also reproduce 10

micrometers or less, and the surface roughness at the time of development was not observed, either.

[0076] Except having changed the thiol compounds of five to comparative example 6 Example 1 into 2-mercaptopbenzooxazol (MBO) or tridecyl mercaptopropionic acid (T-4) from pentaerythritol tetrakis thiopropionate, When carried out like Example 1, the amount of appropriate exposure was 2500  $\text{mJ/cm}^2$  needed [ 4500  $\text{mJ/cm}^2$  and ], respectively, and image quality was not able to reproduce 15 micrometers, either. The surface roughness at the time of development was intense, and many white spots were observed on the surface.

[0077] When carried out like Example 1 except having changed the photopolymerization initiator system of comparative example 7 Example 1 into IRGACURE 651, the amount of appropriate exposure was 7500  $\text{mJ/cm}^2$  needed, and image quality was not able to reproduce 15 micrometers, either.

The 2,2'-screw of example 7 Example 1. They are dicyclopentadienyl Ti-bis- and the 2,6-difluoro- 3 about (o-chlorophenyl)-4,4' and 5,5'-tetraphenyl biimidazole (R-1). -(pyrrole- 1-yl)- except having changed into phenyl-1-yl (R-2), When carried out like Example 1, the amount of appropriate exposure was 55  $\text{mJ/cm}^2$ . Image quality could also reproduce 10 micrometers or less, and the surface roughness at the time of development was not observed, either.

[0078] Except having changed 4 of eight to example 9 Example 1, and 4'-bis(diethylamino) benzophenone (Y-1) into the compound (Y-3) shown with 4 and 4'-bis(dimethylamino) benzophenone (Y-2) or said structural formula, When carried out like Example 1, the amounts of appropriate exposure were 40  $\text{mJ/cm}^2$  and 45  $\text{mJ/cm}^2$ , respectively. Image quality could also reproduce 10 micrometers or less, and the surface roughness at the time of development was not observed, either.

[0079]

[Table 8]

表 6

	バインダ 樹脂	エチレン性 化合物	光重合開始剤系			顔料 (濃度)	透過濃度 (膜厚 $\mu$ m)	適正 露光量	西質
実施例 5	P-1 29重量%	M-1 14重量%	R-1 1.9 重量%	Y-1 1.4 重量%	T-2 1.7 重量%	G-1 52重量%	3.3 (0.9)	70 mj/cm <sup>2</sup>	A
実施例 6	P-1 29重量%	M-1 14重量%	R-1 1.9 重量%	Y-1 1.4 重量%	T-3 1.7 重量%	G-1 52重量%	3.3 (0.9)	80	A
比較例 5	P-1 29重量%	M-1 14重量%	R-1 1.9 重量%	Y-1 1.4 重量%	MBO 1.7 重量%	G-2 52重量%	3.1 (0.9)	4500	C
比較例 6	P-1 29重量%	M-1 14重量%	R-1 1.9 重量%	Y-1 1.4 重量%	T-4 1.7 重量%	G-3 52重量%	3.3 (0.9)	2500	B
実施例 7	P-1 29重量%	M-1 14重量%	R-2 1.9 重量%	Y-1 1.4 重量%	T-1 1.7 重量%	G-4 52重量%	3.4 (0.9)	55	A
比較例 7	P-1 29重量%	M-1 14重量%	イルガキュア-651 5重量%			G-4 52重量%	3.2 (0.9)	7500	D

[0080] Except having changed the carbon black distribution black ink of ten to example 12 Example 1 into the carbon black distribution black ink prepared by the reference examples 5-7 (binder resin is changed into P-1 to P-2, P-3, and P-4), When carried out like Example 1, the amounts of appropriate exposure were  $40\text{ mj/cm}^2$ ,  $70\text{ mj/cm}^2$ , and  $55\text{ mj/cm}^2$ , respectively. Image quality could also reproduce 10 micrometers or less, and the surface roughness at the time of development was not observed, either.

[0081] ethylenic double bond content compound dipentaerythritol hexaacrylate (M-1) of 13 to example 14 Example 1 -- pentaerythritol -- doria -- except having changed into KURIRET (M-2) or tris hydroxyethyl ISOSHINURETOTORI acrylate (M-3), When carried out like Example 1, the amounts of appropriate exposure were  $55\text{ mj/cm}^2$  and  $60\text{ mj/cm}^2$ , respectively. Image quality could also reproduce 10 micrometers or less, and the surface roughness at the time of development was not observed, either.

[0082] Like the example 15 above-mentioned example 1, after forming a black matrix on a glass substrate, the pixel of red, green, and blue 3 colors was formed one by one on the glass substrate on the same conditions as the above-mentioned Examples 2-4, and the light filter was produced. The obtained light filter was highly minute and was a quality thing without a color blot.

[0083]

[Effect of the Invention] According to this invention, it can excel in development nature, and can raise the sensitivity of pigment dispersion resist substantially, and. The photopolymerization nature constituent which was excellent in definition and development nature, was highly

precise, and could provide the photopolymerization constituent for light filters which can form the black matrix and the colored pixel of the high depth of shade of a high protection-from-light rate, and was obtained is excellent also in preservation stability. In particular, a black matrix with a high protection-from-light rate can be manufactured, and a light filter without a higher definition color blot can be provided.

[Translation done.]